Dr. Maxie Dion Schmidt
Curriculum Vitae

Education

Georgia Institute of Technology **Ph.D.**
Doctor of Philosophy in the School of Mathematics *2022*

University of Illinois at Urbana-Champaign **M.S.**
Master of Science in Computer Science *2014*

University of Illinois at Urbana-Champaign **B.S.**
Bachelor of Science in Liberal Arts and Science for Math and in Engineering for Computer Science *2012*

Northwest Missouri State University **A.S.**
Associate of Science from the Missouri Academy of Science, Mathematics and Computing *2004*

Employment

Sandia National Labs 2022
R&D Computer Science Researcher for the Honeywell (DoE) subsidiary division in Albuquerque

Graduate Research Assistant and Software Engineer at Georgia Tech 2018–2022
Mathematical Biology Group Research Assistant and Software Engineer Roles

More than three years with the *Georgia Tech Discrete Mathematics and Molecular Biology* (gtDMMB) research group. Recent work with the group and their growing list of software contributions includes updating, growing, and debugging the existing mathematical visualization code for the *RNAStructViz* application.

Graduate Research Assistant and Software Engineer at Georgia Tech 2022
NFC-Related Open Source Software through University Sponsored COVID-19 Relief Funding Grants

Instructor of Record at Georgia Tech 2021
Course instructor of Integral Calculus *(Math 1552) for the summer 2021 semester*

Graduate Teaching Assistant at Georgia Tech 2017–2021
Roles include: Head TA for Integral Calculus and course grader for combinatorics courses

Freelance Software Engineer 2018–2019
C and C++, Java, and Android OS Application and Library Development

Projects involved creating cryptographic routines and customizing the Chameleon Mini RevG firmware sources in C and C++ for custom private commercial NFC applications.

Computational Consultant and Online Instructor with the University of Washington 2016–2017
Research Assistant Focused on Undergraduate Mentorship and Experimental Math Projects

Remote computational data consultant work, programming, and webserver administration for tiling, geometry, and graph-theoretic projects with the University of Washington in Seattle. Served as an online instructor to teach a junior-level honors mathematics course focused on graphical visualization and exploration of tilings of the plane in Python with an emphasis on software methodology.

Graduate Teaching Assistant at the University of Washington in Seattle 2014–2015
Two Quarters as a Teaching Assistant for Calculus II *in the Department of Mathematics*

Illinois Geometry Lab Programming Consultant 2013–2014
Volunteer Programming Consultant at the University of Illinois at Urbana-Champaign

Involvement in Mathematica and Python related projects within the *Illinois Geometry Lab* (IGL) in the mathematics department. The projects in the IGL were focused on mathematical visualization and community engagement.

Graduate Teaching Assistant at the University of Illinois at Urbana-Champaign 2012–2014
Four Semesters as a Teaching Assistant for Discrete Structures *(CS173)*

Research

Author Information

- Preprint Archive Listing: `https://arxiv.org/a/schmidt_m_2.html`
- OrcID Index: `https://orcid.org/0000-0002-3170-5535`

Publications

- Schmidt, M. D. *Factorization theorems and canonical representations for generating functions of special sums*. Doctoral thesis at the Georgia Institute of Technology (2022).
  https://arxiv.org/abs/2209.12287
- Schmidt, M. D. *A recent open source embedded implementation of the DESFire specification designed for on-the-fly logging with NFC based systems*. In: Arai, K. (eds) Proceedings of the Future Technologies Conference (FTC) 2021, Volume 3 (2021).
  https://doi.org/10.1007/978-3-030-89912-7_12
  https://archive.org/embed/ftc2021-presentation-slides-with-notes
- Schmidt, M. D., Kirkpatrick, A., and Heitch, C. *RNAStructViz: graphical base pairing analysis*. Bioinformatics 197 (2021).
  https://doi.org/10.1101/2021.01.20.427505
- Schmidt, M. D. *Exact formulas for the generalized sum-of-divisors functions*. Integers 21 A19 (2021).
- Mousavi, H. and Schmidt, M. D. *Factorization theorems for relatively prime divisor sums, GCD sums and generalized Ramanujan sums*. Ramanujan J. 54: 309–341 (2021).
  http://doi.org/10.1007/s11139-020-00323-5
- Schmidt, M. D. *Combinatorial sums and identities involving generalized divisor functions with bounded divisors*. Integers 20 A85 (2020).
- Merca, M. and Schmidt, M. D. *Factorization theorems for generalized Lambert series and applications*. Ramanujan J. 51: 391–419 (2020).
  https://doi.org/10.1007/s11139-018-0095-7
- Schmidt, M. D. *A short note on integral transformations and conversion formulas for sequence generating functions*. Axioms Special Issue on Mathematical Analysis and Applications II 8 2, 62 (2019).
  https://doi.org/10.3390/axioms8020062
- Merca, M. and Schmidt, M. D. *The partition function $p(n)$ in terms of the classical Möbius function*. Ramanujan J. 49: 87–96 (2019).
- Merca, M. and Schmidt, M. D. *Generating special arithmetic functions by Lambert series factorizations*. Contrib. Discrete Math. 14 (1): 31–45 (2019).
- Schmidt, M. D. *Zeta series generating function transformations related to generalized Stirling numbers and partial sums of the Hurwitz zeta function*. Online J. Anal. Comb. 13 158. (2018).
- Schmidt, M. D. *New congruences and finite difference equations for generalized factorial functions*. Integers 18 A78 (2018).
- Schmidt, M. D. *Combinatorial identities for generalized Stirling numbers expanding f-factorial functions and the f-harmonic numbers*. J. Integer Seq. 21 18.2.7 (2018).
- Schmidt, M. D. *Jacobi-type continued fractions and congruences for binomial coefficients modulo integers $h \geq 2$*. Integers 18 A46 (2018).
- Merca, M. and Schmidt, M. D. *A partition identity related to Stanley's theorem*. Amer. Math. Monthly 125 10: 929–933 (2018).
  https://doi.org/10.1080/00029890.2018.1521232
- Schmidt, M. D. *Continued Fractions for Square Series Generating Functions*. Ramanujan J. 46: 795–820 (2018).
  https://doi.org/10.1007/s11139-017-9971-9
- Schmidt, M. D. *New recurrence relations and matrix equations for arithmetic functions generated by Lambert series*. Acta Arith. 181 (2017): 355-367.
  http://doi.org/10.4064/aa170217-4-8
- Schmidt, M. D. *Continued fractions and q-series generating functions for the generalized sum-of-divisors functions*. J. Number Theory 180: 579–605 (2017).
  https://doi.org/10.1016/j.jnt.2017.05.023
- Schmidt, M. D. *Generating function transformations related to polylogarithm functions and the k-order harmonic numbers*. Online J. Anal. Comb. 12 2 (2017).
- Schmidt, M. D. *Square series generating function transformations*. J. Inequal. Spec. Funct. 8 2 (2017).
- Schmidt, M. D. *Jacobi-type continued fractions for the ordinary generating functions of generalized factorial functions*. J. Integer Seq. 20 17.3.4 (2017).
- Schmidt, M. D. *A computer algebra package for polynomial sequence recognition*. Illinois IDEALS (2014).
  https://www.ideals.illinois.edu/handle/2142/49378
  https://arxiv.org/abs/1609.07301 (most up-to-date version)
- Schmidt, M. D. *Generalized j-factorial functions, polynomials, and applications*. J. Integer Seq. 13 10.6.7 (2010).

Manuscripts

- Croot, E., Mousavi, H. and Schmidt, M. *On a conjecture of Graham on the p-divisibility of central binomial coefficients*. Preprint (2022).
  `https://arxiv.org/abs/2201.11274`
- Schmidt, M. D. *Exact formulas for partial sums of the Möbius https://play.google.com/store/apps/details?id=com.maxieds.chamele expressed by partial sums weighted by the Liouville lambda function*. Preprint (2021).
  `https://arxiv.org/abs/2102.05842`
- Schmidt, M. D. *A catalog of interesting and useful Lambert series identities*. Preprint (2020).
  `https://arxiv.org/abs/2004.02976`
- Schmidt, M. D. *Pair correlation and gap distributions for substitution tilings and generalized Ulam sets in the plane*. Preprint (2017).
  `https://arxiv.org/abs/1707.05509`
- Schmidt, M. D. *Factorization theorems for Hadamard products and higher-order derivatives of Lambert series generating functions*. Preprint (2017).
  `https://arxiv.org/abs/1712.00608`
- Merca, M. and Schmidt, M. D. *New factor pairs for factorizations of Lambert series generating functions*. Preprint (2017).
  `https://arxiv.org/abs/1706.02359`

Conferences and Talks

AMS Joint Mathematical Meetings Special Session Invited Speaker
Early career number theory research with combinatorics, modular forms, and basic hypergeometric series *2022*

MOBIUS ANT Number Theory Seminar at the University of Montreal
Exact formulas for partial sums of the Möbius function expressed by partial sums of weighted Liouville functions *2022*

Georgia Tech Algebra Seminar Talk
Defining canonically best factorization theorems for the generating functions of special convolution type sums *2021*

AMS Fall Southeastern Sectional Meeting Invited Speaker
Computational aspects of factorization theorems for generating special sums *2019*

Integers Conference
Recent work on Jacobi-type continued fractions *2018*

George Andrews 80^{th} Birthday Conference
New connections between partitions and multiplicative functions *2018*

Undergraduate Mathematics Seminar Talk at Georgia Tech
Partition Identities Related to Stanley's Theorem *2017*

Association of Women in Mathematics Sponsored Talk at Georgia Tech
Partition identities related to Stanley's Theorem *2017*

Georgia Tech AMS Club Seminar
Tilings and work with the SageMath platform *2017*

Young Mathematicians Conference at the Ohio State University
Generalized j-Factorial Functions, Polynomials, and Applications *2012*

Software

Overview

- Experience with C and C++, Python, microcontroller and ATMega firmware programming, Java, shell and cmake scripts, Mathematica, Sage, and LaTeX.
- Development on Linux and Mac OSX including package installation via *Homebrew*.
- Development of Android applications and libraries focusing on NFC, USB interfacing to the Chameleon Mini penetration testing device, audio and video recording, and NFC tag recognition libraries.
- Administration and systems programming for a variety of Linux and Unix-like platforms including desktop maintenance, server administration, and building custom home routers using *OpenBSD*.

STEM Supportive Educational Software

- *GTFold Python*: Python bindings and library to modernize and extend for the historical set of *GTFold* command line utilities for use with Python. It is a scientific computing project to facilitate experimentation with RNA structures in computational biology.
  `https://github.com/gtDMMB/GTFoldPython/wiki`
- *Mathematical Unix Fortune Mod*: A math-related add-on package providing terminal-based text in the form of Unix fortune cookie wisdom and a custom *Concrete Math* book style upper case Σ summation text graphic.

https://github.com/maxieds/math-fortune-mod

- *Mertens Function Manuscript Computational Supplement*: Facilitates computations with the Mertens function in both *SageMath* and *Mathematica*.
  https://github.com/maxieds/MertensFunctionComputations
- *OptiKey "Big Hacker" Keyboard Extensions*: Open source code and documentation that makes typing programming languages on-screen for users with disabilities more accessible. These "big hacker" encoded keyboards are designed to simplify on-screen entry of programming languages, a task which otherwise requires scrolling through multiple cell-phone-type keyboard screens to enter a single line of code or even language statement literals in C++, Perl or Python.
  https://github.com/maxieds/OptiKey/blob/master/README.md
  https://github.com/maxieds/OptiKey/tree/master/keymaps
  https://github.com/OptiKey/OptiKey/blob/master/src/JuliusSweetland.OptiKey.Core/Resources/Keyboards/BigHackerKeyboard.xml
- *Partitions Into Parts Package*: An extendable and expository Mathematica demo package for computing the number of partitions of a positive integer n into parts of the form $pt + a$ for p prime and $0 \leq a < p$.
  https://github.com/maxieds/PartitionsIntoParts
- *Prairie Learn Contributor*: Prairie Learn is an option to replace *Canvas* at many universities that is actively developed at UBC and UIUC and is used on a private server form at UC Berkeley. I have so far contributed code to enable custom function names, symbolic constants, custom-defined operator symbols, and documentation available for use with `sympy` Python library parsing of internal `pl-symbolic-input` elements. This pull request enables crucial parsing for questions in calculus, mathematics and physics by enabling custom function names and symbolic constants like `ln`, `sec`, `atanh`, and `zeta` among others.
  https://github.com/PrairieLearn/PrairieLearn
- *RNAStructViz*: A cross-platform GUI-based application to visualize and compare RNA secondary structures.
  https://github.com/gtDMMB/RNAStructViz/wiki
- *Sage and Mathematica Special Sequence Formula Guess Packages*: UIUC MS thesis software in both Mathematica (original) and Sage (extended). It is designed to guess formulas for special input sequences.
  https://arxiv.org/abs/1609.07301
  https://github.com/maxieds/GuessPolynomialSequences
  https://github.com/maxieds/sage-guess
- *WXML Tilings Python Library*: I was offered an unforgettable opportunity in 2016–2017 to take part in mentoring advanced undergraduates in mathematics by teaching a self-created topics course remotely with the University of Washington. The course outline focused on getting students hands-on experience with experimental mathematics methodology, gap distributions and spatial statistics and visualizing substitition tilings of the plane in the Python programming language.
  https://github.com/maxieds/WXMLTilingsHOWTO/wiki

Other Open Source Software Contributions

- *Android File Picker Light Library*: A file and directory chooser widget library for Android OS that focuses on presenting an easy to configure lightweight UI. Designed to work with newer Android 10 and 11 (API 29+) platforms in the future.
  https://github.com/maxieds/AndroidFilePickerLight
- *Chameleon Mini Crypto Modified Firmware Extension*: A modification of the stock Chameleon Mini firmware sources to enable cryptographically secure and integrity checked binary data uploads onto the device.
  https://github.com/maxieds/ChameleonCryptoModFirmware
- *Chameleon Mini Live Debugger (CMLD)*: The application is a portable interactive NFC debugging and logging tool for Android OS phones that interfaces to the Chameleon Mini RevG hardware over USB.
  https://github.com/maxieds/ChameleonMiniLiveDebugger/wiki
  https://play.google.com/store/apps/details?id=com.maxieds.chameleonminilivedebugger
  https://play.google.com/store/apps/details?id=com.maxieds.chameleonminilivedebugger.paid
- *DESFire Emulation Support for the Chameleon Mini*: The Chameleon Mini is a hardware tool for NFC debugging, card emulation, security testing, reconnaissance, and general purpose low-level data logging for contactless RFID cards. My contributions enable embedded emulation support for the common proprietary Mifare DESFire type NFC tags for use within the ChameleonMini (RevG) firmware.
  https://github.com/emsec/ChameleonMini/blob/master/Doc/DESFireSupportReadme.md
  https://github.com/maxieds/ChameleonMiniDESFireStack
  https://github.com/emsec/ChameleonMini/pull/314 (see also: #286, #287, #319, #322, #323)
- *Homebrew Live Streamer*: A customizable, roll-your-own solution for live A/V recording to an Android phone device. It is also used with live media streaming to Facebook and YouTube for a transparent, open source non-proprietary application to perform the media streaming.
  https://github.com/maxieds/HomeBrewLiveStreamer/wiki

https://play.google.com/store/apps/details?id=com.maxieds.codenamepumpkinsconcert

- *Mifare Classic Tool Library*: A Java and Android OS library wrapper around the functionality of the *Mifare Classic Tool* application for Android phones.
  https://github.com/maxieds/MifareClassicToolLibrary
  https://github.com/maxieds/MCTLibraryDemo
  https://github.com/maxieds/ChameleonMiniUSBInterface
  https://github.com/maxieds/BreadCoSampleApp
- *RNA Project Build Scripts*
  https://github.com/gtDMMB/homebrew-core
  https://github.com/gtDMMB/pmfe/tree/CustomBuildScriptMods-Summer2022-v1